

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-45. (Canceled)

46. (Currently amended) A thin plate manufacturing method of manufacturing a thin plate with a dipping mechanism dipping a surface layer part of a substrate into a melt of a substance including at least either a metallic material or a semiconductor material in a crucible arranged in a main chamber and unloading said substrate by solidifying said melt on the surface of said substrate,

loading said substrate into said main chamber through at least one loading subsidiary chamber adjacent to said main chamber and unloading said substrate from said main chamber through at least one unloading subsidiary chamber adjacent to said main chamber, and
using a vacuum to set the pressure in the loading subsidiary chamber less than atmospheric pressure and substantially the same as the pressure in the main chamber and introducing inert gas into the loading subsidiary chamber and the main chamber, and using a vacuum to set the pressure in the unloading subsidiary chamber less than atmospheric pressure and substantially the same as the pressure in the main chamber and introducing inert gas into the unloading subsidiary chamber.

47. (Previously presented) The thin plate manufacturing method according to claim 46, wherein switching means is arranged between said main chamber and the subsidiary chamber,

for loading said substrate into said main chamber and unloading said substrate from said main chamber along with switching of said switching means.

48. (Previously presented) The thin plate manufacturing method according to claim 47, wherein said subsidiary chamber is constituted of a loading subsidiary chamber and a unloading subsidiary chamber, for synchronizing switching timings of the switching means for said loading subsidiary chamber and the switching means for the unloading subsidiary chamber with each other when opening and closing said loading subsidiary chamber and the unloading subsidiary chamber as well as said main chamber by switching said switching means.

49. (Previously presented) The thin plate manufacturing method according to claim 46, introducing inert gas into said main chamber while setting the pressure of the atmosphere of the main chamber to not more than the atmospheric pressure.

50. (Previously presented) The thin plate manufacturing method according to claim 46, wherein said subsidiary chamber is constituted of a loading subsidiary chamber and a unloading subsidiary chamber for loading said substrate into the main chamber through said loading subsidiary chamber and unloading the substrate to which said thin plate is bonded from the main chamber through said unloading subsidiary chamber.

51. (Previously presented) The thin plate manufacturing method according to claim 46, mounting said substrate on said dipping mechanism, bonding the thin plate by opposing a thin plate growth surface of said substrate to the melt and thereafter directing the thin plate growth

surface to which said thin plate is bonded upward on a position other than a position immediately above said crucible for demounting the substrate from said dipping mechanism along with the thin plate in said main chamber.

52. (Previously presented) The thin plate manufacturing method according to claim 51, simultaneously introducing a plurality of said substrates into said subsidiary chamber from outside, simultaneously loading the plurality of substrates into said main chamber from said subsidiary chamber, further transferring the substrates to a mounting standby position in said main chamber and shifting the substrates one by one from said mounting standby position to a mounting position on said dipping mechanism.

53. (Previously presented) The thin plate manufacturing method according to claim 51, transferring the substrate one by one from a demounting position for demounting the substrate to which said thin plate is bonded from said dipping mechanism into an unloading standby position in said main chamber and simultaneously unloading a plurality of substrates from said unloading standby position into said subsidiary chamber when said substrates accumulate by a prescribed number on said unloading standby position.

54. (Previously presented) The thin plate manufacturing method according to claim 51, wherein said dipping mechanism performs demounting of the substrate to which the thin plate is bonded and mounting of a substrate to which a thin plate is newly bonded through the same operation.

55. (Previously presented) The thin plate manufacturing method according to claim 51, equalizing, in a series of operations of said dipping mechanism moving the substrate from a mounting/demounting position for mounting and demounting the substrate to a position for dipping the substrate into said melt, performing a dipping operation on said substrate for dipping said substrate and thereafter moving said substrate to the mounting/demounting position for demounting said substrate, the direction of the horizontal operation of said substrate with an operational direction for moving the substrate to said mounting/demounting position when performing said dipping operation.

56. (Previously presented) The thin plate manufacturing method according to claim 51, wherein said dipping mechanism mounts a first substrate on a first position in said main chamber, moves onto said crucible for dipping said substrate into said crucible, thereafter moves for demounting said first substrate to which a thin plate is bonded on a second position different from said first position, mounts a second substrate to which a thin plate is newly bonded on said position, moves onto said crucible for dipping said substrate into said crucible and thereafter moves to said first position for demounting said second substrate to which the thin plate is bonded on said position.

57. (Previously presented) The thin plate manufacturing method according to claim 51, detecting the position of a melt level in said crucible for controlling the operation of said dipping mechanism for dipping said substrate into the crucible in response to the position of said melt level.

58. (Previously presented) The thin plate manufacturing method according to claim 51, bonding the thin plate to said substrate with a plurality of dipping mechanisms with respect to one said crucible.

59. (Previously presented) The thin plate manufacturing method according to claim 46, cooling the substrate to which said thin plate is bonded on at least one position in said main chamber, in said subsidiary chamber and outside the chambers.

60. (Previously presented) The thin plate manufacturing method according to claim 46, stopping the operation of said dipping mechanism when the quantity of the melt in said crucible decreases to a prescribed level for refilling a raw material into said crucible while not restarting the operation of said dipping mechanism until the temperature of the melt in the crucible and waving of the melt level thereafter stabilize.

61. (Previously presented) The thin plate manufacturing method according to claim 60, loading said raw material into the main chamber through a refilling subsidiary chamber adjacent to said main chamber when refilling the raw material into said crucible.

62. (Previously presented) The thin plate manufacturing method according to claim 46, simultaneously introducing a plurality of said substrates into said subsidiary chamber from outside and loading the substrates one by one from said subsidiary chamber into said main chamber.

63. (Previously presented) The thin plate manufacturing method according to claim 46, unloading the substrate to which said thin plate is bonded one by one from said main chamber into said subsidiary chamber and simultaneously discharging a plurality of substrates from said subsidiary chamber.

64. (Previously presented) The thin plate manufacturing method according to claim 46, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

65. (Currently amended) A thin plate manufacturing method of manufacturing a thin plate by dipping a surface layer part of a substrate held by a dipping mechanism into a melt of a substance including at least either a metallic material or a semiconductor material in a crucible arranged in a main chamber and solidifying said melt on the surface of said substrate, wherein

said dipping mechanism comprises first substrate transport means for transporting said substrate in a direction for dipping and unloading the substrate into and from said melt, second substrate transport means enabling transportation of said substrate in a second direction different from said first direction and substrate rotation means capable of rotating said substrate by 360°, for dipping the surface layer part of said substrate into the melt in said crucible by controlling operations of said first and second substrate transport means and said substrate rotation means,
and

wherein said first substrate transport means operates to allow the substrate rotation means to be transported in the first direction.

66. (Previously presented) The thin plate manufacturing method according to claim 65, wherein said substrate rotation means rotates said substrate by applying actuating force with reference to a supporting point of its rotation center on a power point different from said supporting point and rotating said power point about said supporting point.

67. (Previously presented) The thin plate manufacturing method according to claim 65, mounting said substrate on a substrate mounting member mounted to be rotatable about said supporting point and rotatable about said power point.

68. (Previously presented) The thin plate manufacturing method according to claim 65, arranging a plurality of said power points with respect to one said supporting point.

69. (Previously presented) The thin plate manufacturing method according to claim 65, wherein said substrate rotation means rotates said substrate by applying actuating force to a shaft passing through its rotation center and rotating the shaft.

70. (Previously presented) The thin plate manufacturing method according to claim 65, equalizing, in a series of operations of said dipping mechanism moving from a mounting/demounting position for mounting and demounting the substrate to a position for dipping the substrate into said melt, performing a dipping operation on said substrate for dipping said substrate and thereafter moving to the mounting/demounting position for demounting said substrate, the direction of the horizontal operation of said substrate with an operational direction

for moving the substrate to said mounting/demounting position when performing said dipping operation.

71. (Previously presented) The thin plate manufacturing method according to claim 65, wherein said dipping mechanism mounts a first substrate on a first position in said main chamber, moves onto said crucible and dips said substrate in said crucible, thereafter moves, demounts said first substrate to which a thin plate is bonded on a second position different from said first position, mounts a second substrate to which a thin plate is newly bonded on said position, moves onto said crucible and dips said substrate into said crucible, thereafter moves to said first position and demounts said second substrate to which the thin plate is bonded on said position.

72. (Previously presented) The thin plate manufacturing method according to claim 65, detecting the position of a melt level in said crucible for controlling the operation of said dipping mechanism dipping said substrate into the crucible in response to the position of said melt level.

73. (Previously presented) The thin plate manufacturing method according to claim 65, bonding the thin plate to said substrate with a plurality of dipping mechanisms with respect to one said crucible.

74. (Previously presented) The thin plate manufacturing method according to claim 65, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

75. (Currently amended) A thin plate manufacturing method of manufacturing a thin plate by mounting a substrate on a dipping mechanism provided in a main chamber, dipping a surface layer part of said substrate into a melt in a crucible arranged in the main chamber and bonding a thin plate to the surface of said substrate,

manufacturing said thin plate by arranging a plurality of dipping mechanisms with respect to said crucible, wherein the plurality of dipping mechanisms utilize a common crucible for dipping and are spaced apart and independent from one another so as to not necessarily move in conjunction with one another.

76. (Previously presented) The thin plate manufacturing method according to claim 75, wherein a second dipping mechanism different from a first dipping mechanism performs at least one of operations of mounting said substrate, demounting the substrate to which said thin plate is bonded, temperature control of said substrate and movement of said substrate when the first dipping mechanism included in said plurality of dipping mechanisms performs a dipping operation.

77. (Previously presented) The thin plate manufacturing method according to claim 75, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

78-90. (Canceled)

91. (New) A thin plate manufacturing method of manufacturing a thin plate with a dipping mechanism dipping a surface layer part of a substrate into a melt of a substance including at least either a metallic material or a semiconductor material in a crucible arranged in a main chamber and unloading said substrate by solidifying said melt on the surface of said substrate,

loading said substrate into said main chamber through at least one loading subsidiary chamber adjacent to said main chamber and unloading said substrate from said main chamber through at least one unloading subsidiary chamber adjacent to said main chamber, and

wherein the dipping mechanism comprises first substrate transport means for transporting the substrate in a direction for dipping and unloading the substrate into and from said melt, second substrate transport means enabling transportation of said substrate in a second direction different from said first direction, and substrate rotation means capable of rotating the substrate by 360 degrees, wherein the first substrate transport means operates to allow the substrate rotation means to be transported in the first direction.

92. (New) The thin plate manufacturing method according to claim 91, wherein switching means is arranged between said main chamber and the subsidiary chamber, for loading said substrate into said main chamber and unloading said substrate from said main chamber along with switching of said switching means.

93. (New) The thin plate manufacturing method according to claim 92, wherein said subsidiary chamber is constituted of a loading subsidiary chamber and a unloading subsidiary chamber, for synchronizing switching timings of the switching means for said loading subsidiary

chamber and the switching means for the unloading subsidiary chamber with each other when opening and closing said loading subsidiary chamber and the unloading subsidiary chamber as well as said main chamber by switching said switching means.

94. (New) The thin plate manufacturing method according to claim 91, introducing inert gas into said main chamber while setting the pressure of the atmosphere of the main chamber to not more than the atmospheric pressure.

95. (New) The thin plate manufacturing method according to claim 91, wherein said subsidiary chamber is constituted of a loading subsidiary chamber and a unloading subsidiary chamber for loading said substrate into the main chamber through said loading subsidiary chamber and unloading the substrate to which said thin plate is bonded from the main chamber through said unloading subsidiary chamber.

96. (New) The thin plate manufacturing method according to claim 91, mounting said substrate on said dipping mechanism, bonding the thin plate by opposing a thin plate growth surface of said substrate to the melt and thereafter directing the thin plate growth surface to which said thin plate is bonded upward on a position other than a position immediately above said crucible for demounting the substrate from said dipping mechanism along with the thin plate in said main chamber.

97. (New) The thin plate manufacturing method according to claim 96, simultaneously introducing a plurality of said substrates into said subsidiary chamber from outside,

simultaneously loading the plurality of substrates into said main chamber from said subsidiary chamber, further transferring the substrates to a mounting standby position in said main chamber and shifting the substrates one by one from said mounting standby position to a mounting position on said dipping mechanism.

98. (New) The thin plate manufacturing method according to claim 96, transferring the substrate one by one from a demounting position for demounting the substrate to which said thin plate is bonded from said dipping mechanism into an unloading standby position in said main chamber and simultaneously unloading a plurality of substrates from said unloading standby position into said subsidiary chamber when said substrates accumulate by a prescribed number on said unloading standby position.

99. (New) The thin plate manufacturing method according to claim 96, wherein said dipping mechanism performs demounting of the substrate to which the thin plate is bonded and mounting of a substrate to which a thin plate is newly bonded through the same operation.

100. (New) The thin plate manufacturing method according to claim 96, equalizing, in a series of operations of said dipping mechanism moving the substrate from a mounting/demounting position for mounting and demounting the substrate to a position for dipping the substrate into said melt, performing a dipping operation on said substrate for dipping said substrate and thereafter moving said substrate to the mounting/demounting position for demounting said substrate, the direction of the horizontal operation of said substrate with an

operational direction for moving the substrate to said mounting/demounting position when performing said dipping operation.

101. (New) The thin plate manufacturing method according to claim 96, wherein said dipping mechanism mounts a first substrate on a first position in said main chamber, moves onto said crucible for dipping said substrate into said crucible, thereafter moves for demounting said first substrate to which a thin plate is bonded on a second position different from said first position, mounts a second substrate to which a thin plate is newly bonded on said position, moves onto said crucible for dipping said substrate into said crucible and thereafter moves to said first position for demounting said second substrate to which the thin plate is bonded on said position.

102. (New) The thin plate manufacturing method according to claim 96, detecting the position of a melt level in said crucible for controlling the operation of said dipping mechanism for dipping said substrate into the crucible in response to the position of said melt level.

103. (New) The thin plate manufacturing method according to claim 96, bonding the thin plate to said substrate with a plurality of dipping mechanisms with respect to one said crucible.

104. (New) The thin plate manufacturing method according to claim 91, cooling the substrate to which said thin plate is bonded on at least one position in said main chamber, in said subsidiary chamber and outside the chambers.

105. (New) The thin plate manufacturing method according to claim 91, stopping the operation of said dipping mechanism when the quantity of the melt in said crucible decreases to a prescribed level for refilling a raw material into said crucible while not restarting the operation of said dipping mechanism until the temperature of the melt in the crucible and waving of the melt level thereafter stabilize.

106. (New) The thin plate manufacturing method according to claim 105, loading said raw material into the main chamber through a refilling subsidiary chamber adjacent to said main chamber when refilling the raw material into said crucible.

107. (New) The thin plate manufacturing method according to claim 91, simultaneously introducing a plurality of said substrates into said subsidiary chamber from outside and loading the substrates one by one from said subsidiary chamber into said main chamber.

108. (New) The thin plate manufacturing method according to claim 91, unloading the substrate to which said thin plate is bonded one by one from said main chamber into said subsidiary chamber and simultaneously discharging a plurality of substrates from said subsidiary chamber.

109. (New) The thin plate manufacturing method according to claim 91, performing temperature control of said substrate before mounting said substrate on said dipping mechanism.

110. (New) The method of claim 75, wherein the dipping mechanism comprises first substrate transport means for transporting the substrate in a direction for dipping and unloading the substrate into and from said melt, second substrate transport means enabling transportation of said substrate in a second direction different from said first direction, and substrate rotation means capable of rotating the substrate by 360 degrees, wherein the first substrate transport means operates to allow the substrate rotation means to be transported in the first direction.